charge thereby adversely affecting the transistors. Specifically, the threshold voltage is varied and likely changed with time.

Furthermore, when the performance of the polycrystalline silicon thin film transistor is improved and the threshold voltage is lowered without removing factors of dispersion, the thin film transistor may inadvertently be in an on-state when it should be in an off state. The present invention has overcome the shortcomings and deficiencies of the prior art and provides a new and improved thin film transistor to control variations in threshold voltage of the thin film transistors deposited over a large substrate and those containing impurities.

In accordance with one exemplary embodiment of the present invention, a first gate electrode is disposed on one surface of the semiconductor thin film and a second gate electrode disposed on the opposite surface. The first and second gate electrodes receive a first gate voltage and a second gate voltage, respectively, through separate and independent wiring. The first gate electrode controls switching of the semiconductor thin film channel depending on the first gate voltage and the second gate electrode actively controls the threshold voltage and thus the on-off operation of the semiconductor thin film channel depending on the second gate voltage.

As noted in the Applicant's specification at page 7, in the first full paragraph, in any of the conventional techniques, only the erroneous operation caused by leakage current is suppressed or an on current is increased through use of a dual gate drive. In contrast, in the claimed invention, in order to overcome the problems of variation in threshold voltages, the second gate electrode actively controls the threshold. Thus, even though the threshold voltage of the n-channel type thin film transistor is shifted to the negative side due to dispersion thereof, the leakage current can be completely shielded. See, for example, Applicant's specification at pages 22-23. As described therein, when the rear gate voltage VGR is 0 V, the threshold voltage is low and the leakage current is large, but it is found that

appropriate off-operation characteristics shown in FIG. 3A can be obtained by lowering the rear gate voltage VGR to -5 V. Thus, by applying the rear gate voltage VGR of -5 V at least when the transistor is in an off-state, a proper operation can be secured even when the threshold voltage is varied. Moreover, the Applicant's specification at page 23 in the first full paragraph explains that by individually applying gate voltage pulses to each of the front and rear gate electrodes, the present invention properly operates the semiconductor thin film channel.

In this manner, by allowing the second gate electrode to actively control threshold voltage by receiving independent voltage through its own wiring, it is possible to control the threshold voltage depending on the respecting circuits and stably, effectively operate the circuits. Applicant respectfully submits that the prior art reference of record provides no teaching or suggestion regarding this advance in the art. More specifically, Applicant noted that the primary reference upon which the Examiner relies for rejecting the claims is the *Kubota* reference, United States Patent No. 5,808,595. *Kubota* discloses that a conductive electrode is placed so as to face the corresponding gate electrode with a channel region of the active layer located in between, and a constant voltage is applied to the conductive electrode. This reference notes that if the threshold voltage of the thin-film transistor is offset in the negative direction or the positive direction from a desired value for a certain reason, it is possible to make them virtually equal to each other or the absolute value of the threshold voltage of the n-channel-type transistor and the absolute value of the threshold voltage of the p-channel-type transistor by shifting the threshold voltage by applying a voltage to the conductive electrode.

Thus the threshold voltage is adjusted. However, this is not active adjustment depending a desired operating state. The *Kubota* reference teaches the addition of a conductive electrode with a constant current to which voltage can be applied to shift the

threshold value. The *Kubota* reference neither teaches nor suggests that the threshold voltage should be actively varied through the use of a second gate electrode, which receives a separate voltage from its own wiring, to independently control the threshold voltage of the semiconductor thin film channel and thus the switching operation of the same as provided by the Applicant's present invention.

Finally, the Applicant respectfully requests reconsideration of the rejections based on the holding of *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 15 U.S.P.Q.2d 1522 (Fed. Cir. 1990). In *Hewlett-Packard*, the court stated that apparatus claims cover what a device is, not what a device does in response to B & L's assertion that HP must show "operational differences between the claimed device and prior art. *Id.* at 1468. The Federal Circuit in HP was addressing issues of infringement and not the propriety of using functional language to distinguish from the prior art. The current claims are distinct from the cited art based on functional characteristics set forth as means-plus function limitations. Congress long ago provided the statutory basis for distinguishing claims on this basis under 35 U.S.C. §112. Therefore, Applicant requests that the Examiner now withdraw the rejections and allow all claims in the application.

In light of the foregoing Applicants respectfully request that the Examiner set forth a Notice of Allowance for this application.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail on December 26, 2002 in an envelope addressed to:

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